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### **American Journal of Pharmacy**

Published monthly by the Philadelphia College of Pharmacy and Science  
43rd Street, Kingsessing and Woodland Avenues, Philadelphia 4, Pa.

Annual Subscription, \$3.00

Single Numbers, 30 Cents

Foreign Postage, 25 Cents Extra

Back Numbers, 50 Cents

Entered as Second-Class Matter March 27, 1937, at the Post Office at Philadelphia, Pa.  
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\*Reiter, P. J., Experience with Benzedrine, Ugeskr. f. læger, 99:459-460, 1937.



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# AMERICAN JOURNAL OF PHARMACY AND THE SCIENCES SUPPORTING PUBLIC HEALTH

Since 1825

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Vol. 117.

JUNE, 1945

No. 6

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# E D I T O R I A L

## IS NOW THE TIME TO INCREASE THE EDUCATIONAL REQUIREMENTS FOR PHARMACY?

CONSIDERABLE thought is now being given to the question of increasing the time required for the completion of a course of pharmaceutical education by instituting a pre-pharmacy year. In fact a special committee of pharmaceutical educators has been asked to study this problem and to make recommendations. Their task is a difficult one in view of the many factors that have a bearing on the matter.

There is no doubt but that the increased recognition and prestige of pharmacy both professionally and on the campus stems from the progressive step taken in 1932 when the four-year course was adopted as the minimum academic program of study given by an accredited college of pharmacy. Until that time the old three-year technicians' course was given by many schools and graduates of such courses found themselves as little recognized academically as dental technicians or radio mechanics.

It was indeed a great day for pharmacy when these courses were discontinued and we owe a lasting debt of gratitude to those educators who were responsible for this improvement in our standards. There was opposition to this plan just as there always is to any progressive change and the opposition was powerful. Were it not for courageous leadership we would still be saddled with the old system.

We now are confronted with a similar situation, but not an identical one, and rare indeed is the pharmaceutical leader who sees no problem attached to again raising our educational requirements. In the first place we are faced with an acute shortage of pharmaceutical personnel. This condition was prevalent before the war and it has been greatly intensified by the increased need of manpower to accommodate the armed services and an expanded civilian economy. During the war our student enrollment has declined to an almost negligible number, far too small to replace even those who are withdrawn from the ranks by death or retirement. This latter situation cannot be remedied for a number of years since it takes four years to train a student after he enrolls and there is still no prospect of a normal freshman enrollment.

So acute has become this shortage that sufficient legislative pressure has been applied in a number of states to cause the enactment of laws permitting qualified assistants to take the examinations for registered pharmacist. This in some instances waives *all* college training as a prerequisite and in all instances ignores the standards which we were years building up. It is not unlikely that certain political demagogues will in time try to pass legislation permitting easy access to pharmacy by returning servicemen, legislation that very easily may be backed by citizens suffering with the emotional hysteria summed up in the expression "we owe it to our boys." Organized pharmacy must be strong and united if these efforts are to be defeated and no such strength and unity is apparent in a number of states. It is fortunate that we do have strong leadership, nationally, in the A. Ph. A., as a result of recent changes.

An added year or years of collegiate training preceding pharmacy would go far in placing pharmacy on the same level as medicine and dentistry and the time will come when this must be done. We must not, however, ignore the consequences of improper timing for this change. If we could be sure that our laws governing the practice of pharmacy would remain intact in spite of public pressure and that our colleges would survive another ten lean years, now, while there is such a demand for pharmacists, would be an ideal time to institute the change. But will they? Is it not possible that this might prove "the straw that broke the camel's back"? To start such a program and then be forced to withdraw it would set pharmacy back years in its struggle ahead.

Another problem that must be faced by those responsible for developing a new program is what degree is the graduate to receive. Shall it be only the Bachelor's degree after spending five or six years in college? Should it be a Master's degree? Some thought should be given the desirability of a professional degree, Doctor in Pharmacy, since only then will we be on a truly equal level with medicine and dentistry. Our present degree of Bachelor of Science in Pharmacy is neither academic nor professional since the professional subjects admittedly overload the student and weaken his achievement in the scientific and cultural courses. Such a degree also detracts from our arguments tending to prove the professional nature of our calling.

These are indeed serious problems that must be carefully studied and things of great consequence to pharmacy will hinge upon the decisions reached.

L. F. TICE

## SIR ALEXANDER FLEMING

*Editor's Note*—The sojourn of Sir Alexander Fleming in this country has been filled with honors and testimonial dinners to the now famous discoverer of penicillin. Among these was a testimonial dinner given him on June 18, 1945, at the Bellevue-Stratford in Philadelphia, by the Public Health Committee of the Chamber of Commerce. The toastmaster was the eminent Philadelphia physician Dr. Mervyn Ross Taylor. Sir Alexander was presented by Dr. Ivor Griffith, whose presentation address follows.

*Guest of Honor, Ladies and Gentlemen:*

GATHERED here in William Penn's City of Brotherly Love, and in an atmosphere made pleasant and comfortable because of the friendly respect which this distinguished audience has for achievement in humanitarian service, I begin my brief presentation by quoting from the intimate little notebook of a resourceful and resolute searcher after truth, working in the bacteriological laboratory of the St. Mary's Hospital of London, England.

This is the quotation:

*"I was sufficiently interested to pursue the subject. The appearance of the culture plant was such that I thought it should not be neglected."*

Moses, tending the flock of Jethro, the Midianite, on the slopes of Mount Horeb saw a blooming acacia bush burning brightly, yet unhurt, despite the incandescent halo whirling in its tender foliage, and at once Moses said, *"Lord, here am I."*

Those of you who own and know the Bible may verify this story.

Moses, that ancient Doctor of Hygiene and Law, might just as well have said,

*"The appearance of the burning bush was such that I thought it should not be neglected and I was sufficiently interested to pursue the subject."*

Moses *did* pursue the subject and with Jehovah's guidance brought to the world the Ten Commandments, a code of ethics so fine that its practice, to date, has never caught up with its theory, except in the flawless life of the lowly Nazarene.

*"Tenez, voici sa figure"!* ("There, you have its outlines"!)

Louis Pasteur used this expression at a meeting of the Paris Academy of Medicine when he illustrated on the blackboard his con-



ception of the little rosary of streptococci which, contrary to existing theories, he insisted were responsible for infection following child-birth and many other prevalent diseases. With the very sound of Pasteur's words came, as it were, the dawn of a new day, because Louis Pasteur, too, had been "*sufficiently interested to pursue the subject*" and he had come upon something "*which he thought should not be neglected.*"

From this epoch-making discovery, the art of medicine and the science of surgery drew a firmer spirit of service and a finer sense of skill. Out of the world went a heap of sadness and man's burdens eased upon his weary shoulders. It was the tanner's boy from Arbois in France who thus changed the whole aspect of medicine and surgery.

And, now, from the hamlet of Lochfield, shadowed by the heathered Ayrshire hills comes the son of a sturdy Scotch farmer, who sits with us tonight, a humble man whose resolve and intelligence have made possible another new epoch in medicine. It was from his laboratory notebook compiled at St. Mary's that the stimulating and refreshing quotation was drawn. From that period, when he scribbled the typical stubborn Scotch comment into his notebook, through the tedious but telling experiments leading to his scholarly paper in the *British Journal of Experimental Pathology*, June, 1929, Alexander Fleming continued to hunt, and ultimately found, what today is described as the most heroic drug ever dreamed of or produced by man; namely, Penicillin. He had the philosophy that anything extraordinary should be studied and that the gods on Olympus had favored him with the charge and challenge to "*pursue the subject.*"

Alexander Fleming heralded a new day in preventive and curative medicine when he recognized the halo around the spot where an adventitious mold had liquidated some colonies of naughty germs upon the culture media and the halo on the petri dish was a halo in every sense of the word, for it has already spread its light upon another epoch in medicine. After Fleming's initial report in 1929 and a ten year period of incubation, Florey of Oxford and others were attracted to the study of the product and the World War accelerated the need for so critical a healing material. After clinical confirmation came of its usefulness by men such as Drs. Chester Keefer, John Stokes and many others, then was organized and con-

summed the great task of those who had to convert the laboratory curiosity into the product which simply *had* to find its way, for the sake of the fullest extent of its use, into the prescription departments of pharmacies, the dispensaries of hospitals and the hand bags of the doctors. The National Research Council, largely through Dr. Newton Richards, induced the Rockefeller Foundation and others to lend a hand in these achievements.

For, no matter how high, haloed or holy a medical discovery, it does not save lives until the essence of the discovery is available to all who need it. In the story of Penicillin, from its discovery by the guest of honor tonight, to this moment, rests the fact of one of the greatest business gambles of all time and the word "gamble" is fairly used, for this was a gamble glorified with idealism and now justified because of its success. No one then knew that Penicillin could be produced in the required tremendous quantities and made ready for its fruitful distribution. Furthermore, no one was certain but that some chemist might, by synthesis after analysis, duplicate it over night and possibly throw into the discard all of these gigantic assemblies designed for its manufacture. Never in the history of medicine has there been such a unique example of collaborative efforts—scientific, industrial and administrative. And the great chemical and pharmaceutical houses of America played a heroic part in this dramatic victory.

But of all these achievements, Fleming's was, by far, the most momentous because it was the beginning. Humanity can well be proud of the fortitude in fortuity of this great servant of science and of mankind, who refused to by-pass a challenge to his initiative and enterprise and who helped to practicalize for all the world the vagrant gift which the gods had blown through his laboratory window and on to his agar plate.

Ladies and gentlemen! I have the pleasure of presenting to you, an epoch maker in medicine, who, in spite of his insistent humility, must tonight accept our salutation in the spirit in which it is tendered because he so well harnessed a simple adventitious occurrence to practicality that he has made one of the most outstanding contributions in history to the welfare and health of the people of the world.

Ladies and gentlemen, I give you, Sir Alexander Fleming of London, England, and of Posterity!



## ECONOMIC REALITIES

---

### SOURCES AND EFFECTS OF TAXES

By Karl Scholz \*

**A**LL taxes that are paid come out of someone's income. Strictly speaking, therefore, all taxes are in the nature of income taxes. This broad generalization must sound somewhat incredible to those who have been paying property taxes, sales taxes, stamp taxes, gasoline taxes, etc., in addition to personal income taxes. Yet a little reflection will show the fundamental soundness of the assertion.

One may easily be misled by the many descriptive titles given to various taxes, ranging all the way from amusement taxes to death duties. In the last analysis, all taxes boil down to compulsory payments in one way or another, out of someone's income. Inasmuch as income, in the first instance, arises out of production, and accrues to those who aid in production, either with their personal services or with their property, tax revenue is derived from various income streams flowing out of production. This does not alter the fundamental proposition that taxes must come out of someone's income.

Take, for example, the so-called local real estate tax. A person does not ordinarily turn over to the government a part of his home, be it a door, a window, or the roof, when he pays his real estate tax. He gives the tax collector some of his income, regardless of whether he realized it from the ownership of the property taxed or from any other income source. If he should be so unfortunate as to be faced with a sheriff sale for non-payment of his real property tax, the purchaser of the property, if one can be found, would have to provide the necessary income to pay the delinquent tax.

Evidences of ownership, or legal claims to wealth and income, such as stocks, bonds, mortgages and the like, obviously produce no income, but merely give the owner a legal claim to a share in wealth and income. Although in financial language it is customary to speak of the earnings of stock and the yield of bonds, these expressions are

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\* Professor of Economics, Philadelphia College of Pharmacy and Science, and University of Pennsylvania.

really legal fictions, rather than economic realities. Pieces of paper, as such, no matter how carefully they may be worded, and how beautifully they may be engraved, neither earn nor yield any income. They are nothing more nor less than evidences of legal claims. If there were nothing to claim, they would be practically worthless, although their owners might show some sentimental attachment to them. Safe deposit boxes of decedents all too often reveal accumulations of misplaced hopes and shattered dreams in the form of worthless securities, or more properly, insecurities.

If, therefore, intangible personal property is taxed, the owner must pay the taxes imposed on such items out of whatever income is at his disposal. Authorities are generally agreed that taxes on intangible personal property in the form of various legal evidences of ownership, often bear only a remote relationship to the actual income accruing to the owner of these claims. The taxes must therefore be paid out of other income available to the taxpayer.

Sales taxes are really taxes on that portion of a person's income spent to purchase the items taxed. It is somewhat misleading to call these taxes either sales taxes, outgo taxes, or spending taxes, when actually they are merely taxes on that part of income paid out for the items to which the tax has been attached. When a business concern sets aside a depreciation reserve out of its earnings, this reserve is intended to replace capital used up in production, by investing it to employ labor and material resources to keep capital values intact. If the government taxes away this depreciation reserve, it is in reality not a tax on capital, but on the income that must be invested to maintain capital values. Even here it is a case of taxing income, although the tax may bring about the destruction of capital by taking away income that has to be invested to replace capital consumed in the course of production of final consumption goods.

Taxes on corporation earnings must also be paid out of someone's income. Net profits of business corporations, when disbursed as dividends become income to stockholders. If retained by a corporation for further investment, they are the equivalent of savings of income withheld from stockholders. The amount of net corporate profits absorbed by taxes is thus taken out of the income which might otherwise have accrued to stockholders, or have been retained for corporate expansion. A variety of other corporation taxes, whether they are called capital stock taxes, franchise taxes, capitalization taxes

and the like, must obviously also be paid out of some source or other of income.

And so we might continue with every one of the fifty-seven varieties of taxes imposed by governments, and trace them to taxes on someone's income. Because all these taxes are attached to so many different objects, the impression is widely prevalent that the items bear the taxes levied against them. This is an illusion. Actually the objects taxed can yield no more tax revenue than can the ashcans in one's cellar, or the garbage pail in the pantry.

Since taxes, directly or indirectly, must be paid out of income, the logical place to levy taxes is on net income, i. e. the income remaining to the taxpayer after various legitimate costs have been deducted, incidental to acquiring his income. There is an ever widening recognition of the basic soundness of levying taxes on incomes accruing to individuals. Moreover, since beyond a certain point, every additional dollar tends to add less real benefits to the taxpayer, the principle of progressive taxation has come to be generally accepted as equitable and fair. An additional dollar ordinarily does not mean as much to a person receiving a thousand dollars a month income, as another dollar a month does to one getting only a hundred dollars. The want that the former might satisfy with his added dollar is apt to be far less important than that satisfied with the expenditure of an additional dollar received by the latter. If income were equally distributed among taxpayers, uniform tax rates would tend to be in accordance with ability to pay. But in the face of highly unequal individual incomes, it is rather obvious that a sacrifice of ten per cent of a person's net income of \$2000 per year is far greater than a sacrifice of ten per cent of a \$200,000 net income. The soundness of progressive taxation of individual net incomes is generally recognized by authorities on taxation.

Let us next consider briefly the general effects of taxes imposed on the national income by agencies of government, whether Federal, state or local. Basically taxes cause a redistribution of the national income. If, for example, \$20 billion of a national income of \$100 billion were absorbed by taxes, the taxpayers would have a twenty per cent smaller income to spend as they saw fit, while those engaged in rendering public service of various kinds would be paid the \$20 billion. But this assumes that all of the \$20 billion collected in taxes are going to be paid by government to provide collective or com-

munal services, be they in the form of penal institutions for criminals or public schools for children.

Where, however, a large part of the tax revenue collected by the Federal government after the war will be used to service the huge national debt, the extent of income redistribution due to these taxes may not be particularly great. Insofar as taxpayers pay taxes, which are repaid to them in the form of debt service charges, there is obviously no resultant redistribution of income. But those who are getting their tax dollars back in the form of payments on public debt, may in consequence not be bearing their proportionate share of the current costs for the public services. Therefore some taxpayers may be required to give up a disproportionately large part of their incomes, partly for the benefit of the holders of government securities. Thus, no matter how we look at it, taxes make for a redistribution of the national income. Moreover, steeply progressive personal income taxes will level down individual incomes after taxes, and thus tend to increase the benefits derived from consuming the national income, particularly if governments use the tax revenue wisely and efficiently in the common interest.

The effects of taxes tend to differ, depending on whether there is full employment of our productive resources by private enterprise, or whether there is a large margin of unemployment. Taxes imposed during a period of business boom, particularly if levied on that portion of income that would normally seek further investment opportunities, will tend to check the boom, and allow consumption to catch up with production. On the other hand, taxes on that portion of the income normally spent for consumers' goods, will, in a period of depression, further decrease consumers' demand, and so accentuate unemployment still more. At such a time, sound governmental fiscal policy suggests reduction of taxes in the lower income brackets, and the expansion of public credit to aid in the employment of idle resources. With proper cooperation between public and private enterprise, this would help to expand the national income again and thus build up once more the ultimate source of taxes, namely the national income.

The taxing power exercised by governments may serve either to stimulate business activity, or to hold business in check. A sound program of taxation must therefore be judged in the light of its effects on the functioning of our economic system, and be so devised as to

aid in stimulating as well as stabilizing business activity. This suggests the need for carefully relating governmental taxing policy to general business conditions, and not proceeding on the assumption that what is a sound program of taxation at one time is necessarily good for all times. The importance of weighing our various war-time taxes, in relation to our post-war economy, cannot be overstressed. Numerous research agencies, both public and private, are actively engaged in studying the possible effects of various war-time taxes on our peacetime economy. All these studies are apparently aimed at using the taxing power of government to aid, rather than to hinder, the reconversion of industry to a sound and stable peacetime basis.

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**"Protein Hydrolysate" Famine Food. (Editor.)** *Pharm. J.* 100, 222 (1945). A predigested diet called "F-food" which consists of a protein hydrolysate and contains glucose, amino acids and vitamins is now being supplied to the peoples of various liberated countries.

This product is prepared in two ways: (1) For intravenous injection, a solution of amino-acids is obtained by an acid digestion, and to this is added tryptophane, since the latter is destroyed during the process. Glucose is added to the solution; the daily dose is two liters, an amount equivalent to 50 gm. of protein. (2) The oral product consists of a powdered mixture of amino-acids with di- and tri-peptides obtained by the enzymatic digestion of casein and meat, plus vitamins A, D, C, B<sub>1</sub>, riboflavin and nicotinic acid. This preparation, with added glucose, is dissolved in water and administered by mouth or stomach tube.

In cases of starvation there may be no raw material present from which the necessary enzymes can be produced. It is stated that dramatic results have been achieved after three or four days of treatment with this predigested food, and that soon thereafter the patient can be placed on a milk diet.

# A STUDY OF THE SALIVARY SULFATHIAZOLE LEVELS PRODUCED BY SULFATHIAZOLE GUM

By J. W. E. Harrison<sup>1</sup> and E. W. Rees<sup>2</sup>

## Introduction

THE use of a sulfonamide, incorporated in a chewing vehicle for the treatment of certain mouth and throat infections was first reported by Arnett (1). Fox *et al.* (2) investigated the salivary levels of sulfanilamide, sulfathiazole and sulfadiazine resulting when a wafer containing one of these drugs was chewed for a period of time. They found that the ideal sulfonamide for inclusion in such a dosage form was sulfathiazole, sulfanilamide being too soluble to provide a prolonged effect and sulfadiazine not sufficiently soluble to give an effective salivary concentration. The effect of chewing a gum wafer containing sulfathiazole on the bacterial count of mouth rinsings was also given and the observation made that sulfathiazole gum was most effective in its restraining influence on the beta hemolytic streptococcus. Pfeiffer and Holland (3) reported their findings on the salivary concentrations of sulfadiazine and sulfathiazole, the former in a paraffin base and the latter in both a paraffin and a chicle base. Their results agreed with those of Fox and his co-workers in that sulfathiazole is preferable to sulfadiazine for administration in this form. They furthermore reported that a paraffin base was inferior to one made of chicle since the former tends to fragment in the first 15 minutes of chewing.

In this paper the authors report their results using eighty-four test subjects, each chewing sulfathiazole gum. The salivary concentration of total and dissolved sulfathiazole, and the salivary volume and pH were determined in each case, at definite intervals, until the expiration of sixty minutes. Tables of these results, and graphs illustrating the average values over the test period, are presented.

## Procedure

### General

The product used was White's Sulfathiazole Gum purchased on open market and containing 0.25 Gm. sulfathiazole per tablet. The

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<sup>2</sup> LaWall & Harrison Laboratories.



subjects, who were mostly students, reported for the test in the morning prior to class work, generally at about 8 A. M. In order to facilitate the work, groups were limited to not more than six persons. Each subject was instructed as to the general procedure, and specifically in regard to the following:

1. Lip-stick was to be removed.
2. Mouth was not to be rinsed either before starting test or during test.
3. No eating or drinking was allowed during the test.
4. Smoking was permitted but it was not desirable.
5. Reading to help pass the time was advised.
6. The gum was to be chewed with a continuous movement at a slow methodical rate.
7. Swallowing of saliva was to be avoided.
8. During each period as sufficient saliva accumulated in the mouth, it was to be expelled into the receptacles provided for the purpose.

Each subject was furnished with nine small beakers. Secreted saliva was received into these, being collected at five-minute intervals for the first six consecutive periods (30 minutes of elapsed time) and for three succeeding ten-minute periods (a total elapsed chewing time of sixty minutes).

#### *General Laboratory Procedure*

Immediately upon completion of a period, the pH of the saliva was read by Beckman pH meter using a glass electrode, and the total volume of saliva was then approximately determined in graduated centrifuge tubes. A suitable quantity was removed for the determination of the total sulfathiazole content. The remainder of each sample was centrifuged for fifteen minutes at five to six thousand r. p. m. and from the clear supernatant layer a quantity was withdrawn for the determination of dissolved sulfathiazole. Centrifuging was employed rather than filtration due to the small amount available in a number of the samples.

#### *Analytical Procedure*

A minor modification of the procedure of Marshall, Emerson, and Cutting (4) and Marshall (5) was employed. The reagents used were as follows:

- (1) Sulfathiazole U. S. P. dried to constant weight as a Reference Standard, 0.05 Gm. per liter, in alcohol.
- (2) Trichloroacetic Acid ..... 15% W/V
- (3) Sodium Nitrite ..... 0.1% W/V
- (4) Ammonium Sulfamate ..... 0.5% W/V  
Sodium Dihydrogen Phosphate ..... 13.8% W/V
- (5) Dimethyl-*a*-naphthylamine 0.4% in 95% alcohol

One cc. of saliva, either whole or centrifuged, was diluted to 100 cc. with water. Aliquots of this solution were used for the determination of sulfathiazole. Usually between 2 to 5 cc. were necessary. The appropriate quantity was transferred to a 30 cc. tube, made to 10 cc. with water and to this was added 1 cc. trichloroacetic acid solution and 1 cc. of sodium nitrite solution. After three minutes, one cc. of the ammonium sulfamate-sodium phosphate solution was added and then 5 cc. of the dimethyl-*a*-naphthylamine, two minutes later. It was then allowed to stand ten minutes for the development of color.

Color intensity was read on a Coleman DM spectrophotometer and concentration calculated from a standard curve prepared by using U. S. P. Sulfathiazole as the Reference Standard.

### Results

#### *Salivary Concentration of Total and Dissolved Sulfathiazole Upon Masticating a Single Gum Tablet*

Total and dissolved sulfathiazole concentration of the saliva of each subject for each period of observation is reported in Table I. The average content of the dissolved sulfathiazole varied from 41.5 mg. to 88.9 mg. per 100 cc. of saliva, and seemed to be affected but little by the amount of saliva secreted. The average concentration at the end of the first five minute period was 50.8 mg., a slight fall was then observed for the ten and fifteen minute periods, followed by a consistent and gradual rise until the end of the test, when the concentration was 88.9 mg. Seventy-four subjects were observed. Three of them, however, did not in all instances supply sufficient saliva for determining the dissolved sulfathiazole content and therefore these are largely excluded from the averages.

The total sulfathiazole concentration was on the average higher than the dissolved sulfathiazole content; this of course, was to be



TABLE  
INDIVIDUAL SUBJECT DATA ON SALIVARY pH, VOLUME AND SULFAT

Subject	pH	(5 Minutes) Concentration Mg. per 100 cc			pH	(10 Minutes) Concentration Mg. per 100 cc			pH	(15 Minutes) Concentration Mg. per 100 cc			pH	(20 Minutes) Concentration Mg. per 100 cc			pH	Vol
		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		
1.	6.8	10.5	46	34	7.4	4.5	48	37	8.0	4.0	61	53	8.0	6.0	77	66	8.0	
2.	6.8	3.5	73	60	7.2	4.5	73	62	7.3	2.5	80	66	7.3	4.0	90	66	7.4	
3.	6.6	10.0	67	50	7.2	5.0	80	75	7.4	4.1	110	85	7.8	5.3	115	103	7.9	
4.	6.6	5.8	62	31	6.7	6.2	32	25	6.9	6.0	32	25	7.4	4.7	30	31	7.5	
5.	6.8	14.7	45	45	6.5	10.4	45	44	6.5	9.0	52	50	6.8	10.2	61	55	7.1	10
6.	6.6	7.3	51	43	7.0	4.7	44	39	6.9	4.5	44	41	7.3	5.7	51	45	7.5	
7.	7.0	5.0	77	55	7.0	4.2	60	55	7.0	5.5	55	55	7.6	6.1	67	56	7.8	
8.	6.5	6.0	77	70	6.9	6.1	82	57	7.5	7.7	74	70	7.9	8.0	98	97	8.0	8
9.	6.9	7.6	49	37	7.4	6.2	29	22	7.6	4.1	25	19	7.5	6.1	36	16	7.7	
10.	6.6	4.8	44	42	6.7	5.2	43	26	6.7	3.3	40	25	6.8	5.3	21	20	7.0	
11.	7.3	5.3	43	39	7.5	4.6	45	45	8.0	3.8	52	52	8.1	3.6	65	65	8.1	
12.	7.6	5.7	32	25	8.0	3.0	35	35	7.5	4.1	46	45	7.9	3.3	52	52	7.9	
13.	6.9	7.1	47	44	7.2	5.1	38	26	7.5	4.8	28	26	8.1	4.4	41	41	8.1	
14.	6.7	6.1	65	58	6.4	5.4	39	32	6.3	5.7	46	37	6.4	4.2	67	37	6.8	
15.	6.0	< 1 cc	126		5.8	< 1 cc	109		5.6	< 1 cc	81		5.4	< 1 cc	95		5.5	< 1
16.	7.1	7.5	35	32	7.6	6.4	28	27	7.7	4.9	30	28	7.5	6.2	39	38	7.5	
17.	6.4	6.4	64	64	5.6	5.4	66	60	6.4	3.8	86	61	7.2	3.0	92	72	7.4	
18.	6.7	4.5	71	49	6.9	2.2	60	48	7.0	3.1	57	40	7.2	2.6	70	48	7.6	
19.	6.7	7.1	52	50	7.0	4.4	39	26	6.9	4.5	37	24	7.1	4.2	45	40	7.5	
20.	7.4	4.4	57	54	7.0	4.4	65	39	7.3	4.8	77	67	7.7	3.8	97	79	7.9	
21.	7.6	3.3	52	50	7.9	2.8	42	40	7.9	2.2	46	42	7.8	2.1	47	45	7.8	
22.	5.5	4.3	66	63	5.3	2.5	45	42	5.3	2.9	46	43	5.3	2.0	63	60	5.7	
23.	7.1	8.5	43	42	7.6	6.5	40	39	7.5	9.5	39	38	7.5	8.5	43	40	7.6	
24.	7.3	7.4	53	53	7.6	4.6	65	65	7.8	5.2	78	73	7.8	6.4	86	84	7.9	
25.	7.2	8.6	67	60	7.7	5.2	80	46	7.8	4.2	65	49	7.7	4.0	58	57	7.8	
26.	7.0	8.8	27	26	7.8	5.2	25	24	7.8	6.0	24	23	7.8	5.7	25	25	8.1	
27.	5.2	3.9	50	48	5.1	1.0	39		5.0	1.3	35		5.5	0.8	38		5.8	
28.	6.5	8.2	52	40	6.0	4.7	22	34	5.7	4.0	34	34	6.5	3.1	25	25	6.7	
29.	6.8	18.0	26	23	6.8	12.2	19	17	7.4	13.5	19	19	7.7	10.5	23	19	7.5	1
30.	7.0	4.5	32	25	6.7	3.7	40	36	7.1	4.3	37	37	7.4	4.4	38	33	7.7	
31.	7.0	6.7	34	31	6.9	5.0	26	23	6.7	7.7	23	21	7.2	6.3	27	26	7.3	
32.	7.1	4.5	56	49	7.4	7.0	64	63	7.5	6.0	71	68	7.4	7.2	84	80	7.4	
33.	6.3	2.3	53	50	6.1	2.5	40	39	5.6	3.1	31	27	6.1	2.9	35	34	6.8	
34.	6.5	< 1 cc			6.5	< 1 cc			6.3	< 1 cc			6.4	< 1 cc			6.8	<
35.	7.2	5.5	43	43	7.7	5.6	31	31	7.8	4.2	28	28	7.8	4.4	30	30	7.9	
36.	6.3	3.7	65	65	6.3	2.3	48	47	6.4	1.5	46	43	6.5	1.6	45	43	6.7	
37.	6.3	6.6	58	56	7.3	5.4	44	44	7.6	4.3	42	42	7.7	3.3	52	52	7.8	

\* Disintegrated.

**TABLE I**

**INDIVIDUAL SUBJECT DATA ON SALIVARY pH, VOLUME AND SULFATHIAZ**

s) on cc	(15 Minutes) Concentration Mg. per 100 cc				(20 Minutes) Concentration Mg. per 100 cc				(2 Con Mg	
	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc
37	8.0	4.0	61	53	8.0	6.0	77	66	8.0	5.0
62	7.3	2.5	80	66	7.3	4.0	90	66	7.4	3.5
75	7.4	4.1	110	85	7.8	5.3	115	103	7.9	2.0
25	6.9	6.0	32	25	7.4	4.7	30	31	7.5	6.1
44	6.5	9.0	52	50	6.8	10.2	61	55	7.1	10.3
39	6.9	4.5	44	41	7.3	5.7	51	45	7.5	7.7
55	7.0	5.5	55	55	7.6	6.1	67	56	7.8	7.0
57	7.5	7.7	74	70	7.9	8.0	98	97	8.0	8.7
22	7.6	4.1	25	19	7.5	6.1	36	16	7.7	4.3
26	6.7	3.3	40	25	6.8	5.3	21	20	7.0	5.0
45	8.0	3.8	52	52	8.1	3.6	65	65	8.1	4.2
35	7.5	4.1	46	45	7.9	3.3	52	52	7.9	4.2
26	7.5	4.8	28	26	8.1	4.4	41	41	8.1	3.7
32	6.3	5.7	46	37	6.4	4.2	67	37	6.8	2.8
	5.6	< 1 cc	81		5.4	< 1 cc	95		5.5	< 1 cc
27	7.7	4.9	30	28	7.5	6.2	39	38	7.5	6.3
60	6.4	3.8	86	61	7.2	3.0	92	72	7.4	3.8
48	7.0	3.1	57	40	7.2	2.6	70	48	7.6	2.6
26	6.9	4.5	37	24	7.1	4.2	45	40	7.5	3.8
39	7.3	4.8	77	67	7.7	3.8	97	79	7.9	2.8
40	7.9	2.2	46	42	7.8	2.1	47	45	7.8	1.7
42	5.3	2.9	46	43	5.3	2.0	63	60	5.7	2.4
39	7.5	9.5	39	38	7.5	8.5	43	40	7.6	9.2
65	7.8	5.2	78	73	7.8	6.4	86	84	7.9	4.6
46	7.8	4.2	65	49	7.7	4.0	58	57	7.8	5.6
24	7.8	6.0	24	23	7.8	5.7	25	25	8.1	3.9
	5.0	1.3	35		5.5	0.8	38		5.8	1.2
34	5.7	4.0	34	34	6.5	3.1	25	25	6.7	2.9
17	7.4	13.5	19	19	7.7	10.5	23	19	7.5	12.8
36	7.1	4.3	37	37	7.4	4.4	38	33	7.7	4.7
23	6.7	7.7	23	21	7.2	6.3	27	26	7.3	7.6
63	7.5	6.0	71	68	7.4	7.2	84	80	7.4	6.5
39	5.6	3.1	31	27	6.1	2.9	35	34	6.8	2.9
	6.3	< 1 cc			6.4	< 1 cc			6.8	< 1 cc
31	7.8	4.2	28	28	7.8	4.4	30	30	7.9	4.1
47	6.4	1.5	46	43	6.5	1.6	45	43	6.7	1.9
44	7.6	4.3	42	42	7.7	3.3	52	52	7.8	3.8

TABLE I

## FATHIAZOLE CONCENTRATIONS DURING CHEWING OF ONE TABLET

(25 Minutes) Concentration Mg. per 100 cc				(30 Minutes) Concentration Mg. per 100 cc				(40 Minutes) Concentration Mg. per 100 cc				(50 Minutes) Concentration Mg. per 100 cc				(60 Minutes) Concentration Mg. per 100 cc			
Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH
5.0	90	75	8.1	5.0	97	87	7.9	11.5	107	92	7.8	11.0	107	95	7.8	14.0	107	92	
3.5	90	72	7.5	3.0	100	76	7.4	8.0	95	72	7.4	5.0	105	78	7.4	5.0	125	82	
2.0	135	120	7.9	3.8	142	127	7.9	5.9	200	165	7.8	4.1	280	187	7.8	4.4	300	165	
6.1	35	34	7.8	6.1	45	31	7.8	9.3	50	42	7.5	8.1	60	59	7.6	11.0	72	62	
10.3	60	54	7.4	12.5	71	70	7.4	20.6	77	80	7.4	19.8	75	64	7.4	22.1	69	52	
7.7	59	59	7.6	5.0	80	71	7.5	8.9	84	73	7.4	9.6	92	74	7.3	9.7	132	87	
7.0	80	80	7.7	4.0	106	107	7.7	8.4	106	116	7.8	10.0	142	135	7.7	11.6	175	145	
8.7	127	126	8.0	6.2	157	153	7.9	11.3	157	118	7.8	14.8	181	153	7.8	14.0	175	153	
4.3	23	17	7.8	3.5	34	15	7.7	10.2	32	15	7.5	11.4	29	24	7.6	11.2	41	35	
5.0	41	26	7.3	4.3	45	28	7.3	9.8	49	29	7.4	10.1	57	34	7.4	10.2	83	49	
4.2	89	89	8.1	4.1	100	100	7.9	9.9	141	107	7.9	9.9	195	143	7.7	7.3	170	130	
4.2	51	48	8.1	3.4	63	61	7.8	10.0	63	61	7.9	7.8	72	72	7.9	10.5	73	72	
3.7	43	43	8.0	4.1	49	48	8.0	8.4	56	55	8.0	7.3	72	67	8.0	9.7	77	76	
2.8	86	51	7.1	4.6	94	46	7.1	6.6	163	60	7.2	7.0	209	70	7.2	9.4	233	67	
< 1 cc	128		5.6	< 1 cc	95		5.9	< 1 cc	159		*	*							
6.3	49	48	7.6	5.5	60	60	7.7	10.3	75	72	7.6	7.8	91	52	7.6	9.8	112	60	
3.8	109	83	7.6	3.7	145	105	7.5	7.6	184	113	7.7	7.8	208	136	7.7	6.7	356	147	
2.6	85	69	7.7	1.7	107	105	7.7	6.4	114	77	7.7	4.3	162	105	7.6	8.3	237	117	
3.8	49	45	7.7	4.1	56	52	7.6	8.6	67	57	7.6	9.8	77	65	7.6	9.8	108	77	
2.8	100	80	7.9	2.7	102	82	7.8	5.7	112	110	7.8	6.5	115	83	7.9	5.6	146	122	
1.7	50	46	8.0	1.7	58	51	7.9	4.1	62	58	8.1	3.2	70	62	8.0	3.4	70	62	
2.4	88	87	6.3	2.6	184	173	6.5	6.5	120	117	6.9	6.4	209	200	7.0	4.2	204	193	
9.2	53	52	7.6	9.1	52	55	7.5	16.0	76	73	7.4	16.4	72	70	7.4	15.5	92	86	
4.6	118	110	7.8	4.0	163	147	7.7	8.1	155	110	7.7	9.0	216	132	7.7	7.5	192	137	
5.6	69	68	7.9	5.0	77	76	7.5	10.5	110	77	7.4	13.2	169	97	7.5	10.6	92	88	
3.9	38	39	8.0	5.1	42	42	7.8	9.5	50	50	7.9	6.6	64	60	7.9	7.6	70	70	
1.2	42		6.0	0.9	138		6.6	4.4	148	86	*	*							
2.9	27	24	7.0	4.0	26	25	7.1	7.8	27	25	7.3	7.3	28	28	7.4	7.5	32	31	
12.8	24	20	7.5	17.5	27	24	7.4	20.8	31	24	7.4	21.5	30	29	7.6	20.8	31	27	
4.7	47	37	7.6	7.2	47	42	7.6	8.2	61	48	7.7	6.4	73	69	7.7	5.4	89	84	
7.6	36	29	7.1	10.4	43	43	7.2	13.6	64	52	7.2	12.7	45	45	7.3	9.7	89	72	
6.5	91	83	7.3	9.0	89	89	7.2	16.4	97	84	7.1	19.0	105	98	7.2	17.5	122	110	
2.9	37	37	6.8	2.5	47	35	7.1	5.3	53	53	7.5	5.6	65	64	7.5	5.6	80	80	
< 1 cc			7.2	< 1 cc			*	*											
4.1	32	26	7.9	3.4	40	39	7.6	10.2	44	43	7.8	8.5	59	58	7.6	8.9	81	77	
1.9	44	39	7.1	2.4	37	36	7.3	4.0	55	48	7.5	4.3	86	73	7.4	3.4	141	84	
3.8	62	62	7.9	2.3	65	65	7.7	7.0	80	78	7.7	5.6	154	54	7.7	7.6	196	60	

I  
THIAZOLE CONCENTRATIONS DURING CHEWING OF ONE TABLET

(25 Minutes) Concentration Mg. per 100 cc				(30 Minutes) Concentration Mg. per 100 cc				(40 Minutes) Concentration Mg. per 100 cc				(50 Minutes) Concentration Mg. per 100 cc				(60 Minutes) Concentration Mg. per 100 cc			
Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH
5.0	90	75	8.1	5.0	97	87	7.9	11.5	107	92	7.8	11.0	107	95	7.8	14.0	107	92	
3.5	90	72	7.5	3.0	100	76	7.4	8.0	95	72	7.4	5.0	105	78	7.4	5.0	125	82	
2.0	135	120	7.9	3.8	142	127	7.9	5.9	200	165	7.8	4.1	280	187	7.8	4.4	300	165	
6.1	35	34	7.8	6.1	45	31	7.8	9.3	50	42	7.5	8.1	60	59	7.6	11.0	72	62	
10.3	60	54	7.4	12.5	71	70	7.4	20.6	77	80	7.4	19.8	75	64	7.4	22.1	69	52	
7.7	59	59	7.6	5.0	80	71	7.5	8.9	84	73	7.4	9.6	92	74	7.3	9.7	132	87	
7.0	80	80	7.7	4.0	106	107	7.7	8.4	106	116	7.8	10.0	142	135	7.7	11.6	175	145	
8.7	127	126	8.0	6.2	157	153	7.9	11.3	157	118	7.8	14.8	181	153	7.8	14.0	175	153	
4.3	23	17	7.8	3.5	34	15	7.7	10.2	32	15	7.5	11.4	29	24	7.6	11.2	41	35	
5.0	41	26	7.3	4.3	45	28	7.3	9.8	49	29	7.4	10.1	57	34	7.4	10.2	83	49	
4.2	89	89	8.1	4.1	100	100	7.9	9.9	141	107	7.9	9.9	195	143	7.7	7.3	170	130	
4.2	51	48	8.1	3.4	63	61	7.8	10.0	63	61	7.9	7.8	72	72	7.9	10.5	73	72	
3.7	43	43	8.0	4.1	49	48	8.0	8.4	56	55	8.0	7.3	72	67	8.0	9.7	77	76	
2.8	86	51	7.1	4.6	94	46	7.1	6.6	163	60	7.2	7.0	209	70	7.2	9.4	233	67	
1 cc	128		5.6	< 1 cc	95		5.9	< 1 cc	159			*							
6.3	49	48	7.6	5.5	60	60	7.7	10.3	75	72	7.6	7.8	91	52	7.6	9.8	112	60	
3.8	109	83	7.6	3.7	145	105	7.5	7.6	184	113	7.7	7.8	208	136	7.7	6.7	356	147	
2.6	85	69	7.7	1.7	107	105	7.7	6.4	114	77	7.7	4.3	162	105	7.6	8.3	237	117	
3.8	49	45	7.7	4.1	56	52	7.6	8.6	67	57	7.6	9.8	77	65	7.6	9.8	108	77	
2.8	100	80	7.9	2.7	102	82	7.8	5.7	112	110	7.8	6.5	115	83	7.9	5.6	146	122	
1.7	50	46	8.0	1.7	58	51	7.9	4.1	62	58	8.1	3.2	70	62	8.0	3.4	70	62	
2.4	88	87	6.3	2.6	184	173	6.5	6.5	120	117	6.9	6.4	209	200	7.0	4.2	204	193	
9.2	53	52	7.6	9.1	52	55	7.5	16.0	76	73	7.4	16.4	72	70	7.4	15.5	92	86	
4.6	118	110	7.8	4.0	163	147	7.7	8.1	155	110	7.7	9.0	216	132	7.7	7.5	192	137	
5.6	69	68	7.9	5.0	77	76	7.5	10.5	110	77	7.4	13.2	169	97	7.5	10.6	92	88	
3.9	38	39	8.0	5.1	42	42	7.8	9.5	50	50	7.9	6.6	64	60	7.9	7.6	70	70	
1.2	42		6.0	0.9	138		6.6	4.4	148	86		*							
2.9	27	24	7.0	4.0	26	25	7.1	7.8	27	25	7.3	7.3	28	28	7.4	7.5	32	31	
12.8	24	20	7.5	17.5	27	24	7.4	20.8	31	24	7.4	21.5	30	29	7.6	20.8	31	27	
4.7	47	37	7.6	7.2	47	42	7.6	8.2	61	48	7.7	6.4	73	69	7.7	5.4	89	84	
7.6	36	29	7.1	10.4	43	43	7.2	13.6	64	52	7.2	12.7	45	45	7.3	9.7	89	72	
6.5	91	83	7.3	9.0	89	89	7.2	16.4	97	84	7.1	19.0	105	98	7.2	17.5	122	110	
2.9	37	37	6.8	2.5	47	35	7.1	5.3	53	53	7.5	5.6	65	64	7.5	5.6	80	80	
1 cc			7.2	< 1 cc				*											
4.1	32	26	7.9	3.4	40	39	7.6	10.2	44	43	7.8	8.5	59	58	7.6	8.9	81	77	
1.9	44	39	7.1	2.4	37	36	7.3	4.0	55	48	7.5	4.3	86	73	7.4	3.4	141	84	
3.8	62	62	7.9	2.3	65	65	7.7	7.0	80	78	7.7	5.6	154	54	7.7	7.6	196	60	

TABLE I (C)

## INDIVIDUAL SUBJECT DATA ON SALIVARY pH, VOLUME AND SULFATE

Subject	pH	(5 Minutes) Concentration Mg. per 100 cc			pH	(10 Minutes) Concentration Mg. per 100 cc			pH	(15 Minutes) Concentration Mg. per 100 cc			pH	(20 Minutes) Concentration Mg. per 100 cc			pH	Vo
		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		
38.	7.1	10.6	43	43	7.4	8.6	35	35	7.6	5.6	30	30	7.6	7.2	37	37	7.8	
39.	6.5	5.3	53	53	6.4	5.2	44	43	6.7	2.5	46	45	7.0	3.2	58	53	7.3	
40.	6.9	7.5	53	50	7.3	5.5	46	45	7.1	4.1	47	46	7.1	4.0	60	43	7.2	
41.	7.1	8.8	67	63	7.4	5.3	81	70	7.7	3.1	80	71	7.8	3.5	93	89	7.9	
42.	6.8	9.0	73	72	7.3	7.2	65	64	7.7	4.5	90	89	8.0	4.0	95	94	8.1	
43.	6.4	9.2	76	63	6.6	7.5	51	47	7.2	8.5	72	61	7.6	7.5	118	81	7.6	
44.	6.6	8.4	45	23	6.9	6.6	27	23	7.0	7.4	26	23	7.0	5.7	24	24	7.0	
45.	5.2	9.3	44	44	6.2	6.9	36	31	6.9	7.4	42	42	7.5	5.3	57	56	7.7	
46.	6.6	7.9	82	56	7.3	5.4	57	39	7.2	5.6	71	41	7.2	5.1	69	44	7.4	
47.	6.6	7.4	77	77	7.1	4.3	48	47	7.0	4.6	60	45	7.2	5.2	72	53	7.4	
48.	5.9	5.1	88	73	5.6	3.9	34	40	5.2	4.0	47	39	6.6	3.2	46	42	7.2	
49.	5.8	2.3	130	116	5.8	2.4	100	92	6.1	1.8	110	72	5.9	1.8	109	73	6.6	
50.	6.5	12.9	43	37	7.6	9.1	39	26	7.9	8.1	58	48	8.1	7.4	72	59	8.0	
51.	6.9	8.2	83	68	7.3	8.5	48	43	7.7	7.1	50	34	8.0	6.7	57	50	8.1	
52.	6.9	8.4	30	27	7.2	5.1	24	22	7.2	5.1	26	24	7.4	7.0	29	27	7.7	
53.	6.3	4.3	61	45	6.5	3.3	33	31	6.6	2.3	38	30	6.4	2.6	36	30	6.7	
54.	7.2	6.4	37	30	7.3	7.4	22	24	7.5	6.6	29	28	7.7	4.3	35	33	7.6	
55.	6.7	7.3	50	41	6.8	7.1	25	23	6.9	5.6	24	24	7.2	4.3	28	28	7.1	
56.	5.9	5.6	64	64	5.7	3.6	66	52	5.4	3.6	73	46	6.0	3.2	81	52	6.9	
57.	6.4	4.6	80	71	6.8	3.3	64	52	6.8	4.1	55	49	7.1	2.2	53	52	7.0	
58.	7.2	8.7	52	49	7.5	5.1	45	44	7.3	5.6	44	43	7.8	3.6	43	43	8.0	
59.	7.3	10.3	43	39	7.4	10.9	40	37	7.8	9.1	44	42	8.1	8.1	42	35	8.2	
60.	6.6	4.1	59	60	6.7	4.3	41	43	7.2	5.4	41	44	7.8	2.1	56	65	7.3	
61.	5.7	3.1	86	93	5.6	5.1	42	43	6.8	7.1	38	41	7.2	2.8	48	50	7.6	
62.	6.6	6.1	43	48	7.2	7.5	21	23	7.3	9.1	21	22	7.6	4.1	23	27	7.8	
63.	6.9	5.5	60	64	6.2	4.3	38	43	6.6	5.1	32	35	7.2	2.3	37	45	7.5	
64.	7.1	5.4	68	76	7.4	5.9	47	51	7.6	7.5	57	55	7.8	6.1	71	74	7.7	
65.	6.7	7.7	33	35	6.6	5.1	27	27	6.6	6.1	24	24	6.9	6.8	24	25	7.1	
66.	6.2	10.4	56	48	6.8	6.8	66	56	7.7	7.1	80	82	8.2	6.4	117	116	8.0	
67.	6.9	8.3	72	64	6.0	4.0	79	55	5.5	3.1	87	49	5.5	4.6	147	50	6.3	
68.	7.2	9.1	21	24	7.5	8.1	22	23	7.5	9.4	22	22	7.6	9.2	23	24	7.7	10
69.	6.7	5.7	58	53	6.8	3.4	53	45	6.9	3.5	45	41	7.0	4.6	61	51	7.3	
70.	5.9	10.0	32	35	6.4	6.6	38	31	7.0	6.9	62	44	7.5	6.7	65	65	7.5	
71.	6.7	8.0	31	28	6.9	6.0	39	37	7.4	5.7	80	65	7.5	5.8	85	81	7.4	
72.	7.3	1.7	62	56	7.4	0.9	67	49	7.3	1.5	52	47	7.4	1.3	52	48	7.4	
83.	6.7	4.4	52	47	6.2	3.1	57	57	6.2	3.1	62	38	6.6	3.0	107	82	7.1	
84.	6.2	2.2	73	64	6.0	1.0	76	65	6.0	1.2	89	66	5.9	1.0	89	66	6.2	
Average		6.8	56.7	50.8		5.2	47.5	41.5		5.1	51.1	43.7		4.8	59.5	51.3		



TABLE I (Cont)

INDIVIDUAL SUBJECT DATA ON SALIVARY pH, VOLUME AND SULFATH

s) on cc Dis- solved	pH	(15 Minutes) Concentration Mg. per 100 cc			pH	(20 Minutes) Concentration Mg. per 100 cc			pH	Volum cc
		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		
35	7.6	5.6	30	30	7.6	7.2	37	37	7.8	4.
43	6.7	2.5	46	45	7.0	3.2	58	53	7.3	2.
45	7.1	4.1	47	46	7.1	4.0	60	43	7.2	5.
70	7.7	3.1	80	71	7.8	3.5	93	89	7.9	3.
64	7.7	4.5	90	89	8.0	4.0	95	94	8.1	4.
47	7.2	8.5	72	61	7.6	7.5	118	81	7.6	7.
23	7.0	7.4	26	23	7.0	5.7	24	24	7.0	4.
31	6.9	7.4	42	42	7.5	5.3	57	56	7.7	5.
39	7.2	5.6	71	41	7.2	5.1	69	44	7.4	4.
47	7.0	4.6	60	45	7.2	5.2	72	53	7.4	3.
40	5.2	4.0	47	39	6.6	3.2	46	42	7.2	3.
92	6.1	1.8	110	72	5.9	1.8	109	73	6.6	1.
26	7.9	8.1	58	48	8.1	7.4	72	59	8.0	8.
43	7.7	7.1	50	34	8.0	6.7	57	50	8.1	6.
22	7.2	5.1	26	24	7.4	7.0	29	27	7.7	5.
31	6.6	2.3	38	30	6.4	2.6	36	30	6.7	2.
24	7.5	6.6	29	28	7.7	4.3	35	33	7.6	6.
23	6.9	5.6	24	24	7.2	4.3	28	28	7.1	5.
52	5.4	3.6	73	46	6.0	3.2	81	52	6.9	2.
52	6.8	4.1	55	49	7.1	2.2	53	52	7.0	3.
44	7.3	5.6	44	43	7.8	3.6	43	43	8.0	4.
37	7.8	9.1	44	42	8.1	8.1	42	35	8.2	8.
43	7.2	5.4	41	44	7.8	2.1	56	65	7.3	2.
43	6.8	7.1	38	41	7.2	2.8	48	50	7.6	4.
23	7.3	9.1	21	22	7.6	4.1	23	27	7.8	4.
43	6.6	5.1	32	35	7.2	2.3	37	45	7.5	2.
51	7.6	7.5	57	55	7.8	6.1	71	74	7.7	6.
27	6.6	6.1	24	24	6.9	6.8	24	25	7.1	5.
56	7.7	7.1	80	82	8.2	6.4	117	116	8.0	8.
55	5.5	3.1	87	49	5.5	4.6	147	50	6.3	4.
23	7.5	9.4	22	22	7.6	9.2	23	24	7.7	10.
45	6.9	3.5	45	41	7.0	4.6	61	51	7.3	3.
31	7.0	6.9	62	44	7.5	6.7	65	65	7.5	6.
37	7.4	5.7	80	65	7.5	5.8	85	81	7.4	6.
49	7.3	1.5	52	47	7.4	1.3	52	48	7.4	1.
57	6.2	3.1	62	38	6.6	3.0	107	82	7.1	2.
65	6.0	1.2	89	66	5.9	1.0	89	66	6.2	1.
41.5		5.1	51.1	43.7		4.8	59.5	51.3		4.

## E I (Continued)

## SULFATHIAZOLE CONCENTRATIONS DURING CHEWING OF ONE TABLET

(25 Minutes) Concentration Mg. per 100 cc				(30 Minutes) Concentration Mg. per 100 cc				(40 Minutes) Concentration Mg. per 100 cc				(50 Minutes) Concentration Mg. per 100 cc				(60 Minutes) Concentration Mg. per 100 cc			
pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved
7.8	4.7	39	38	7.9	13.6	48	48	7.5	5.8	34	34	7.6	10.9	34	34	7.8	11.6	38	38
7.3	2.8	72	71	7.5	2.9	74	74	7.5	6.4	108	100	7.6	10.5	135	117	7.7	7.3	215	137
7.2	5.4	45	45	7.3	3.1	67	55	7.1	7.1	86	58	7.3	8.3	97	72	7.3	6.4	121	74
7.9	3.6	115	108	7.6	3.8	137	132	7.7	6.6	166	145	7.7	5.3	285	144	7.6	5.5	430	131
8.1	4.5	116	110	8.0	4.6	135	120	7.7	7.2	207	137	7.7	9.1	240	153	7.7	10.2	245	123
7.6	7.1	112	86	7.8	6.2	137	115	7.6	11.6	137	113	7.8	7.2	215	117	7.4	11.8	220	123
7.0	4.4	33	30	7.3	6.4	33	28	7.1	12.6	37	33	7.1	7.4	48	42	7.0	7.9	47	43
7.7	5.2	67	64	7.7	6.5	62	61	7.6	12.9	73	73	7.6	8.5	83	82	7.6	9.5	114	107
7.4	4.7	89	58	7.4	4.5	79	66	7.3	10.2	88	61	7.3	8.1	102	81	7.2	7.8	133	88
7.4	3.6	76	58	7.6	4.6	132	62	7.4	4.9	95	79	7.4	9.1	118	94	7.4	6.5	150	110
7.2	3.6	47	46	7.7	2.9	53	51	7.2	5.9	70	67	7.4	5.9	120	115	7.3	4.8	164	113
6.6	1.6	241	65	7.8	1.7	414	70	7.2	3.9	490	73	7.2	3.9	724	102	7.2	3.3	830	112
8.0	8.1	70	63	7.8	7.7	85	66	7.6	15.1	106	93	7.6	16.6	111	83	7.7	13.6	142	84
8.1	6.6	57	53	8.1	8.1	50	39	7.9	12.7	66	53	7.8	12.4	70	66	7.8	10.1	62	55
7.7	5.0	44	37	7.6	5.8	37	33	7.5	11.1	53	44	7.5	8.8	71	57	7.4	11.9	95	76
6.7	2.6	39	33	7.0	2.9	66	55	6.9	4.9	93	57	7.0	4.9	137	77	7.0	5.1	181	72
7.6	6.3	40	39	8.0	4.6	47	46	7.7	11.5	77	65	7.8	8.4	70	90	7.7	6.3	70	91
7.1	5.7	47	39	7.9	5.1	44	43	7.2	10.6	62	48	7.3	8.4	52	52	7.2	10.7	85	67
6.9	2.9	113	59	7.0	2.3	135	61	7.1	5.9	230	67	7.2	4.3	432	85	7.2	5.1	428	84
7.0	3.3	65	61	7.2	2.2	127	60	7.1	5.7	127	59	7.0	4.3	110	69	7.1	5.3	145	81
8.0	4.4	45	45	8.1	4.2	52	49	8.0	10.9	57	53	8.0	7.5	60	57	8.0	9.1	58	54
8.2	8.6	49	46	8.2	5.3	62	60	7.9	18.1	71	58	7.9	14.1	71	70	7.8	18.1	60	59
7.3	2.7	57	63	8.1	5.5	57	77	7.9	7.1	70	80	7.8	8.7	72	78	7.8	8.5	107	87
7.6	4.1	52	58	7.7	5.3	72	80	7.6	8.6	71	94	7.6	9.3	170	109	7.6	8.4	300	123
7.8	4.2	23	28	7.9	6.1	23	27	7.8	10.4	27	32	7.8	10.4	27	32	7.8	7.1	33	42
7.5	2.9	43	47	7.7	4.1	49	55	7.5	9.5	57	63	7.6	6.8	108	92	7.6	8.0	80	107
7.7	6.9	72	70	7.7	7.1	85	84	7.5	11.8	93	79	7.5	12.4	110	95	7.5	10.3	159	95
7.1	5.7	28	30	7.3	4.8	28	34	7.2	9.0	44	43	7.3	10.9	41	42	7.3	9.6	46	46
8.0	8.3	130	130	8.0	7.8	159	150	7.8	16.3	164	144	7.8	17.6	154	162	7.8	14.7	113	124
6.3	4.9	205	55	6.7	4.9	244	58	7.0	5.5	268	70	7.0	9.6	331	73	7.0	10.0	212	68
7.7	10.1	24	25	7.6	10.6	24	24	7.6	20.9	26	26	7.5	21.4	30	28	7.5	18.5	27	29
7.3	3.5	65	62	7.5	4.6	81	79	7.5	7.1	98	92	7.6	7.7	110	112	7.5	7.6	169	114
7.5	6.3	87	84	7.4	8.6	90	83	7.4	9.6	115	95	7.4	14.0	100	88	7.4	10.0	92	88
7.4	6.0	59	59	7.5	8.0	91	83	7.4	7.3	105	88	7.3	8.3	112	88	7.3	7.1	145	120
7.4	1.2	58	60	7.5	1.8	57	57	7.6	2.5	74	67	7.6	3.5	84	73	7.5	2.5	89	88
7.1	2.8	110	105	7.3	2.8	96	97	7.2	3.1	109	109	7.2	6.5	107	105	7.2	7.6	118	117
6.2	1.2	150	73	6.2	1.5	110	72	6.5	2.3	181	76	6.7	2.7	184	93	6.8	2.3	198	89
4.7	70.8	58.9		5.0	85.2	67.8		9.2	102.2	73.1		9.2	125.4	83.7		9.0	145.	88.9	

Continued)

# THIAZOLE CONCENTRATIONS DURING CHEWING OF ONE TABLET

(25 Minutes) Concentration Mg. per 100 cc				(30 Minutes) Concentration Mg. per 100 cc				(40 Minutes) Concentration Mg. per 100 cc				(50 Minutes) Concentration Mg. per 100 cc				(60 Minutes) Concentration Mg. per 100 cc			
Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH
0.7	39	38	7.9	13.6	48	48	7.5	5.8	34	34	7.6	10.9	34	34	7.8	11.6	38	38	
2.8	72	71	7.5	2.9	74	74	7.5	6.4	108	100	7.6	10.5	135	117	7.7	7.3	215	137	
5.4	45	45	7.3	3.1	67	55	7.1	7.1	86	58	7.3	8.3	97	72	7.3	6.4	121	74	
10.6	115	108	7.6	3.8	137	132	7.7	6.6	166	145	7.7	5.3	285	144	7.6	5.5	430	131	
15.5	116	110	8.0	4.6	135	120	7.7	7.2	207	137	7.7	9.1	240	153	7.7	10.2	245	123	
21.1	112	86	7.8	6.2	137	115	7.6	11.6	137	113	7.8	7.2	215	117	7.4	11.8	220	123	
26.4	33	30	7.3	6.4	33	28	7.1	12.6	37	33	7.1	7.4	48	42	7.0	7.9	47	43	
32.2	67	64	7.7	6.5	62	61	7.6	12.9	73	73	7.6	8.5	83	82	7.6	9.5	114	107	
37.7	89	58	7.4	4.5	79	66	7.3	10.2	88	61	7.3	8.1	102	81	7.2	7.8	133	88	
43.6	76	58	7.6	4.6	132	62	7.4	4.9	95	79	7.4	9.1	118	94	7.4	6.5	150	110	
49.6	47	46	7.7	2.9	53	51	7.2	5.9	70	67	7.4	5.9	120	115	7.3	4.8	164	113	
55.6	241	65	7.8	1.7	414	70	7.2	3.9	490	73	7.2	3.9	724	102	7.2	3.3	830	112	
61.1	70	63	7.8	7.7	85	66	7.6	15.1	106	93	7.6	16.6	111	83	7.7	13.6	142	84	
66.6	57	53	8.1	8.1	50	39	7.9	12.7	66	53	7.8	12.4	70	66	7.8	10.1	62	55	
72.0	44	37	7.6	5.8	37	33	7.5	11.1	53	44	7.5	8.8	71	57	7.4	11.9	95	76	
77.6	39	33	7.0	2.9	66	55	6.9	4.9	93	57	7.0	4.9	137	77	7.0	5.1	181	72	
83.3	40	39	8.0	4.6	47	46	7.7	11.5	77	65	7.8	8.4	70	90	7.7	6.3	70	91	
89.7	47	39	7.9	5.1	44	43	7.2	10.6	62	48	7.3	8.4	52	52	7.2	10.7	85	67	
95.9	113	59	7.0	2.3	135	61	7.1	5.9	230	67	7.2	4.3	432	85	7.2	5.1	428	84	
101.3	65	61	7.2	2.2	127	60	7.1	5.7	127	59	7.0	4.3	110	69	7.1	5.3	145	81	
107.4	45	45	8.1	4.2	52	49	8.0	10.9	57	53	8.0	7.5	60	57	8.0	9.1	58	54	
113.6	49	46	8.2	5.3	62	60	7.9	18.1	71	58	7.9	14.1	71	70	7.8	18.1	60	59	
119.7	57	63	8.1	5.5	57	77	7.9	7.1	70	80	7.8	8.7	72	78	7.8	8.5	107	87	
125.1	52	58	7.7	5.3	72	80	7.6	8.6	71	94	7.6	9.3	170	109	7.6	8.4	300	123	
131.2	23	28	7.9	6.1	23	27	7.8	10.4	27	32	7.8	10.4	27	32	7.8	7.1	33	42	
137.9	43	47	7.7	4.1	49	55	7.5	9.5	57	63	7.6	6.8	108	92	7.6	8.0	80	107	
143.9	72	70	7.7	7.1	85	84	7.5	11.8	93	79	7.5	12.4	110	95	7.5	10.3	159	95	
149.7	28	30	7.3	4.8	28	34	7.2	9.0	44	43	7.3	10.9	41	42	7.3	9.6	46	46	
155.8	130	130	8.0	7.8	159	150	7.8	16.3	164	144	7.8	17.6	154	162	7.8	14.7	113	124	
161.9	205	55	6.7	4.9	244	58	7.0	5.5	268	70	7.0	9.6	331	73	7.0	10.0	212	68	
167.8	24	25	7.6	10.6	24	24	7.6	20.9	26	26	7.5	21.4	30	28	7.5	18.5	27	29	
173.8	65	62	7.5	4.6	81	79	7.5	7.1	98	92	7.6	7.7	110	112	7.5	7.6	169	114	
179.8	87	84	7.4	8.6	90	83	7.4	9.6	115	95	7.4	14.0	100	88	7.4	10.0	92	88	
185.8	59	59	7.5	8.0	91	83	7.4	7.3	105	88	7.3	8.3	112	88	7.3	7.1	145	120	
191.8	58	60	7.5	1.8	57	57	7.6	2.5	74	67	7.6	3.5	84	73	7.5	2.5	89	88	
197.8	110	105	7.3	2.8	96	97	7.2	3.1	109	109	7.2	6.5	107	105	7.2	7.6	118	117	
203.8	150	73	6.2	1.5	110	72	6.5	2.3	181	76	6.7	2.7	184	93	6.8	2.3	198	89	
70.8 58.9				5.0 85.2 67.8				9.2 102.2 73.1				9.2 125.4 83.7				9.0 145. 88.9			



TABLE  
INDIVIDUAL SUBJECT DATA ON SALIVARY pH, VOLUME AND SULFATE

Subject	pH	(5 Minutes) Concentration Mg. per 100 cc			pH	(10 Minutes) Concentration Mg. per 100 cc			pH	(15 Minutes) Concentration Mg. per 100 cc			pH	(20 Minutes) Concentration Mg. per 100 cc			pH	Vo
		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		
73.	6.9	6.5	59	58	6.9	6.9	49	46	7.2	6.1	27	52	7.3	4.1	69	67	7.3	
74.	6.3	4.1	73	80	5.9	4.1	42	48	6.1	4.1	38	39	6.4	4.2	38	37	6.6	
75.	6.6	11.3	50	55	7.2	9.6	31	34	7.6	6.1	28	33	7.4	8.3	32	35	7.8	
76.	6.6	5.6	76	83	7.1	2.8	60	64	7.2	3.1	53	57	7.0	3.3	57	57	7.2	
77.	6.2	11.8	57	54	6.4	8.6	28	28	6.0	5.1	27	28	5.9	9.5	22	25	6.6	
78.	6.6	15.4	45	37	7.4	7.1	50	48	7.5	6.6	59	59	7.6	11.1	52	52	8.0	
79.	6.5	10.1	65	58	7.4	6.6	49	45	7.3	5.1	62	61	7.2	7.5	59	55	7.6	
80.	4.8	7.7	100	83	5.0	4.0	127	70	4.7	3.1	145	60	4.7	2.6	222	65	5.9	
81.	6.2	6.1	110	78	5.7	3.0	95	70	5.8	2.3	119	69	5.5	3.4	97	69	5.7	
82.	6.0	8.8	77	77	6.0	7.7	44	44	6.3	9.3	57	56	7.3	6.8	81	73	7.7	
Average		8.7	71.2	66.3		6.0	57.5	49.7		5.1	57.5	49.7		5.1	64.5	51.4		

**TABLE II**

**INDIVIDUAL SUBJECT DATA ON SALIVARY pH, VOLUME AND SULFATHIAZOLE**

Subject No.	(15 Minutes) Concentration Mg. per 100 cc				(20 Minutes) Concentration Mg. per 100 cc					
	pH	Volume cc	Total	Dis- solved	pH	Volume cc	Total	Dis- solved	pH	Volume cc
46	7.2	6.1	27	52	7.3	4.1	69	67	7.3	5.2
48	6.1	4.1	38	39	6.4	4.2	38	37	6.6	4.1
34	7.6	6.1	28	33	7.4	8.3	32	35	7.8	6.6
64	7.2	3.1	53	57	7.0	3.3	57	57	7.2	2.3
28	6.0	5.1	27	28	5.9	9.5	22	25	6.6	5.4
48	7.5	6.6	59	59	7.6	11.1	52	52	8.0	7.6
45	7.3	5.1	62	61	7.2	7.5	59	55	7.6	5.4
70	4.7	3.1	145	60	4.7	2.6	222	65	5.9	1.6
70	5.8	2.3	119	69	5.5	3.4	97	69	5.7	2.1
44	6.3	9.3	57	56	7.3	6.8	81	73	7.7	7.2
49.7		5.1	57.5	49.7		5.1	64.5	51.4		6.0

TABLE II

FATHIAZOLE CONCENTRATIONS DURING CHEWING OF TWO TABLETS

H	(25 Minutes) Concentration Mg. per 100 cc				pH	(30 Minutes) Concentration Mg. per 100 cc				pH	(40 Minutes) Concentration Mg. per 100 cc				pH	(50 Minutes) Concentration Mg. per 100 cc				pH	(60 Minutes) Concentration Mg. per 100 cc			
	Volume cc	Total	Dis- solved			Volume cc	Total	Dis- solved			Volume cc	Total	Dis- solved			Volume cc	Total	Dis- solved			Volume cc	Total	Dis- solved	
3	5.2	87	87		7.4	5.7	110	93		7.4	9.6	150	111		7.4	7.1	165	110		7.4	8.1	200	115	
6	4.1	44	43		6.7	4.2	45	44		6.9	7.1	52	47		7.1	3.9	63	63		7.1	5.1	81	66	
8	6.6	35	39		7.6	8.3	31	35		7.5	19.1	38	43		7.6	13.1	40	45		7.6	14.7	45	52	
2	2.3	74	71		7.2	2.3	76	72		7.2	5.5	90	79		7.4	4.7	101	97		7.5	5.7	130	117	
6	5.4	23	26		6.6	6.4	23	26		6.7	16.1	23	27		7.0	13.1	25	28		7.0	12.3	26	31	
0	7.6	59	59		8.0	5.3	54	52		7.9	19.1	68	68		7.9	20.1	69	72		7.8	21.1	80	85	
6	5.4	80	80		7.6	6.1	99	92		7.5	11.0	110	110		7.5	6.5	135	117		7.4	11.5	150	110	
9	1.6	397	74		6.0	2.3	432	75		6.2	5.2	438	79		6.7	4.5	399	86		6.9	4.6	379	95	
7	2.1	92	74		6.9	4.6	221	72		6.6	6.1	376	86		6.9	5.3	315	97		7.1	6.8	480	105	
7	7.2	92	92		7.7	7.3	108	106		7.6	14.1	124	120		7.5	16.1	159	147		7.6	13.4	193	181	
	6.0	72.9	53.3			4.7	98.3	64.5			5.2	119.9	66.7			11.2	146.9	77.0			10.3	176.4	95.7	

# ENTRATIONS DURING CHEWING OF TWO TABLETS

Dis- solved	pH	(30 Minutes) Concentration Mg. per 100 cc			pH	(40 Minutes) Concentration Mg. per 100 cc			pH	(50 Minutes) Concentration Mg. per 100 cc			pH	(60 Minutes) Concentration Mg. per 100 cc		
		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved		Volume cc	Total	Dis- solved
7	7.4	5.7	110	93	7.4	9.6	150	111	7.4	7.1	165	110	7.4	8.1	200	115
8	6.7	4.2	45	44	6.9	7.1	52	47	7.1	3.9	63	63	7.1	5.1	81	66
9	7.6	8.3	31	35	7.5	19.1	38	43	7.6	13.1	40	45	7.6	14.7	45	52
1	7.2	2.3	76	72	7.2	5.5	90	79	7.4	4.7	101	97	7.5	5.7	130	117
5	6.6	6.4	23	26	6.7	16.1	23	27	7.0	13.1	25	28	7.0	12.3	26	31
9	8.0	5.3	54	52	7.9	19.1	68	68	7.9	20.1	69	72	7.8	21.1	80	85
9	7.6	6.1	99	92	7.5	11.0	110	110	7.5	6.5	135	117	7.4	11.5	150	110
4	6.0	2.3	432	75	6.2	5.2	438	79	6.7	4.5	399	86	6.9	4.6	379	95
4	6.9	4.6	221	72	6.6	6.1	376	86	6.9	5.3	315	97	7.1	6.8	480	105
2	7.7	7.3	108	106	7.6	14.1	124	120	7.5	16.1	159	147	7.6	13.4	193	181
3		4.7	98.3	64.5		5.2	119.9	66.7		11.2	146.9	77.0		10.3	176.4	95.7

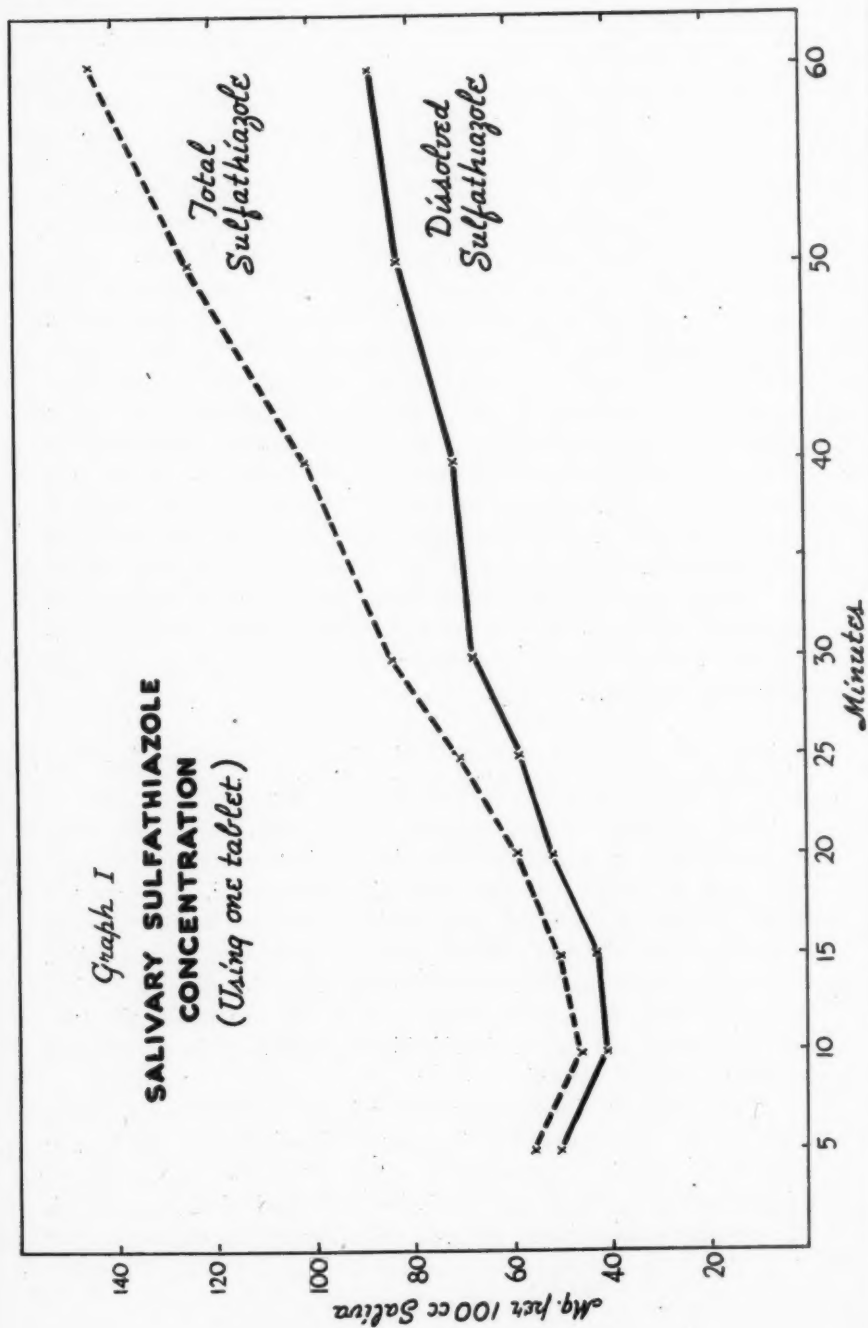
expected. Initially its concentration averaged 56.7 mg., rising to 145 mg. per 100 cc. of saliva at the end of the sixty minute period. The figures for the total sulfathiazole content were influenced considerably by a few individuals who exhibited abnormal chewing characteristics. Outstanding among these was disintegration of the gum. This was apparently associated with a saliva of low pH and usually one low in volume. In three instances disintegration occurred to such an extent it was impossible to collect sufficient saliva for examination.

The mean average concentration of dissolved sulfathiazole over the entire sixty minute masticatory period was 67.1 mg. per 100 cc. of saliva, and of total sulfathiazole 93 mg. per 100 cc. of saliva. (See Graph I.) The curves for both dissolved and total sulfathiazole content as shown in Graph I follow each other reasonably well. It is believed that the procedure employed made possible the determination of reasonable differences of concentration of sulfathiazole. In the case of some few subjects, in whom disintegration of the gum occurred, it was likely that the total sulfathiazole concentration was influenced by gum particles containing the drug. This did not, of course, affect the concentration of dissolved sulfathiazole. Were it not for the abnormals which markedly affected the total sulfathiazole concentration, it is reasonable to assume that these curves would approximate each other even more closely.

#### *Salivary Concentration of Total and Dissolved Sulfathiazole Upon Masticating Two Sulfathiazole Gum Tablets*

Ten additional subjects masticated two sulfathiazole gum tablets under identical conditions of testing as the seventy-four subjects who used one tablet. Under these circumstances, i. e. where the actual available sulfathiazole was doubled, no considerable increase of concentration of either total or dissolved sulfathiazole in the saliva was noted. The significance is obvious; even though this subject group is small, one can reasonably draw the conclusion that the amount of total and dissolved sulfathiazole available to a patient will be under adequate control.

The character of the curves for total and dissolved sulfathiazole concentration are similar to those observed using one sulfathiazole gum tablet, namely, they exhibit a slight fall at the ten and fifteen minute periods and then a gradual rise to the end of the test period. The average concentration for total sulfathiazole during the various



periods was 71.2 mg. to 176 mg. per 100 cc. of saliva, and for dissolved sulfathiazole 66.3 mg. to 95.7 mg. per 100 cc. of saliva.

The respective mean average for all of the periods was 72.4 mg. of dissolved sulfathiazole and 118 mg. of total sulfathiazole per 100 cc. of saliva. (See Graph II.)

### Summary and Conclusions

I. Eighty-four subjects were used in an effort to study the sulfathiazole-saliva levels during the mastication of sulfathiazole gum tablets.

II. Total and dissolved sulfathiazole, salivary volume, and pH were determined at 5, 10, 15, 20, 25, 30, 40, 50, and 60 minute intervals. Tables presenting these figures are given, as well as graphs illustrating the curves obtained when these values were averaged.

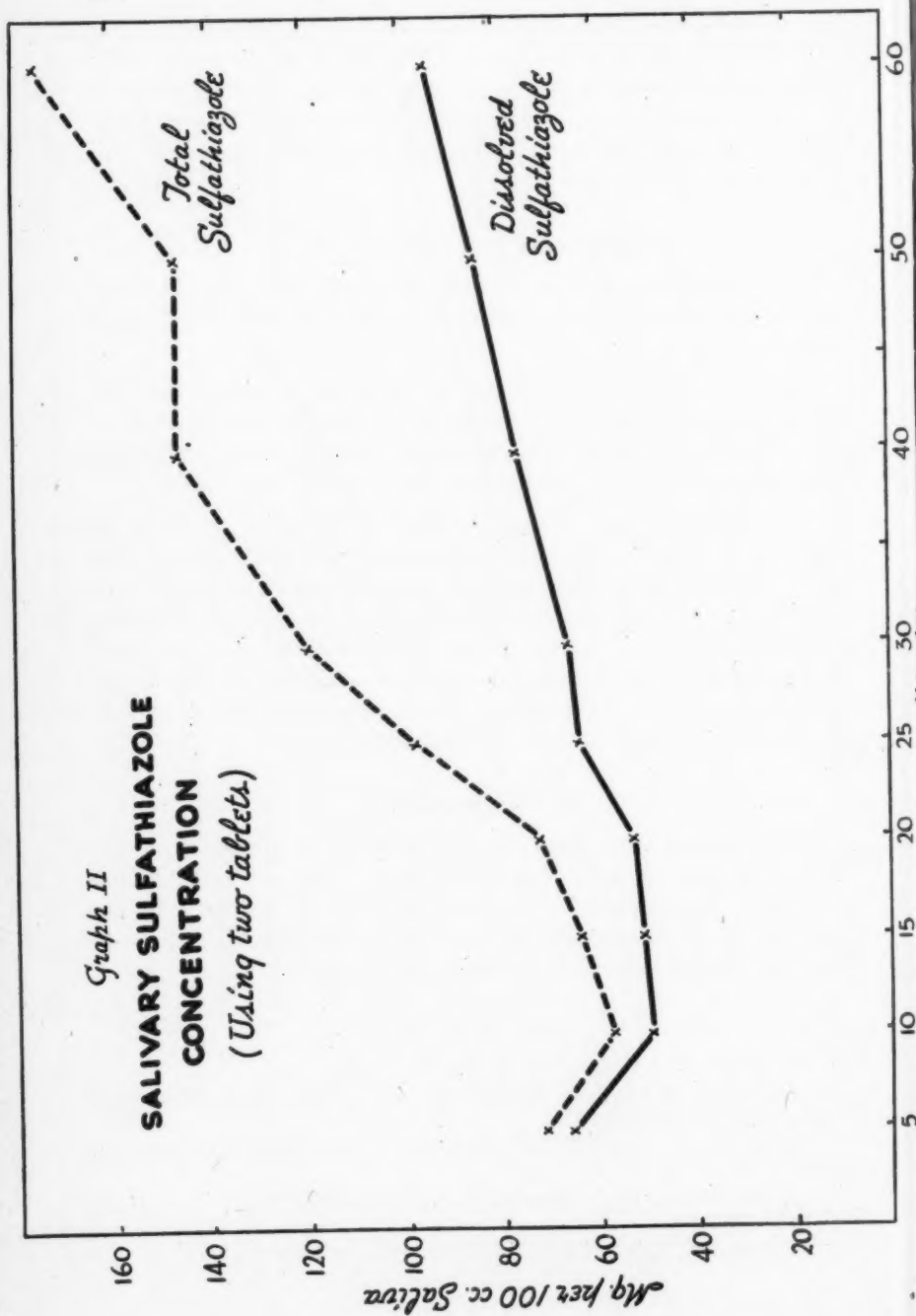
III. The calculated average salivary concentration of dissolved sulfathiazole for the entire sixty minute test period in the group using one sulfathiazole gum tablet was 67.1 mg. per 100 cc. of saliva. Increasing the available number of tablets to two and thus doubling the potential dose in a group of ten subjects resulted in a calculated average salivary concentration of dissolved sulfathiazole of 78.4 mg. per 100 cc. saliva. These findings are in agreement with those previously reported by Fox and his collaborators.

### Acknowledgments

The authors were supported in this work by a grant from the White Laboratories, Inc., of Newark, N. J. They are also indebted to Mr. R. H. Herbine of this company for his guidance in the analytical work and to those students of the Philadelphia College of Pharmacy and Science who served as test subjects.

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## ABSOLUTISM VS. FREEDOM

By T. Swann Harding

THERE was interesting and provocative material in the correspondence columns of the *American Journal of Sociology* for September 1944. It comprised a series of letters in which the editor, Herbert Blumer, sought to acquaint Rex Stout, chairman of the Writers' War Board, with the rudiments of democratic principles. Blumer was somewhat less than successful because his own approach was scientific, objective and critical, while that of Stout was absolutist, dogmatic, and arrogant.

In an earlier issue this "scientific and scholarly publication, devoted to the advancement of sound research and scientific knowledge," had carried two articles which proved offensive to Mr. Stout. They were offensive to him for somewhat the same reasons that the burned books were offensive to the perpetrators of the Inquisition of the Middle Ages, or later to that of Hitler's Germany.

In these articles the authors had contended that a democratic revolution was possible in Germany (it did not occur, but it was possible), that space is a crucial resource for Germany as for many other nations, that there are shocking evidences of "pre-fascist" mentality in the United States—even in the Writers' War Board, and that the future of the common man in fascist countries is shrouded in uncertainty, because the emotionalism of war distorts facts. To Stout these statements were shocking and constituted an apology for German conquest and aggression.

All of the statements, however, are merely plain factual observations, and Stout proceeded to prove the third one by his methodology in the correspondence. For Blumer explained that scientific journals adhere to the democratic principles of free discussion and that their editors, in the best American tradition of free speech, feel obligated to publish many statements with which they do not agree. His letter was a clear delineation of the democratic philosophy for which we are fighting.

Stout, with the best intent in the world, proved entirely incapable of comprehending a transparent statement of scientific and democratic

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freedom. He came back in the manner we associate with "Prussianism," declaring Blumer's courteous letter "something less than adequate," denouncing the two articles mentioned as "trash," and expressing his hostility to a journal which published such contributions from reputable and competent scholars.

Blumer once more tried to make Stout understand rudimentary democratic principles in a letter as clear as his earlier one. Stout once more proved incapable of understanding, and agreed that the correspondence be published. The result is a somewhat shocking revelation to all who believe in freedom of speech and of science and who oppose absolutism and the arrogant and dogmatic assumption that they are right and everyone else is wrong *per se*.

No better example of the contrast between the disinterested and impersonal experimental approach to problems, the scientific approach, and the bigoted and dogmatic approach of the absolutist, could be adduced than this correspondence. It should be widely read. Moreover, it is the fear of what our own absolutists may do to destroy the modicum of freedom we have, which broods over more penetrating observers today.

Except in absolutist countries, where even biology and physics are stamped with political ideology, scientific journals possess freedom from regimentation. Stout, and partisans of absolutism world-wide whether religious, political, economic, or other would permit scientific journals to publish only matters which had won the seal of their approval. Free discussion is beyond the pale. The dogma pervades all and dominates all.

Reputable and well-trained scholars have widely divergent views about the post-war world, and what should be done with Germany, just as they have about the farther reaches of the Einstein theory and the nutrition of human beings. Unless they are free to discuss such matters in scientific journals, scientific progress stops abruptly. As we all know they were not free to engage in such discussion in Nazi Germany, they were not in Fascist Italy, and certainly biologists, at least, as well as most other scientists, were brought into line with the official ideology in Soviet Russia.

These things may be all right for people who like them. But our essential American tradition, and even the Gallup polls, indicate that we do not like them. We prefer a greater measure of free discussion. We prefer a less personal and less emotional approach to fundamen-

tal problems. We prefer what we call democracy, the principles of which could not even be made clear to Rex Stout.

Democracy is essentially a governmental admixture of freedom and order in such proportions that the former does not menace the latter. Democracy is based on the peaceful reconciliation of differences in opinion by free discussion, and the resolution of conflicts, insofar as possible, at the polls. If democracy is to work properly, there must be absolute freedom of expression at all levels, and especially in scientific publications.

There are, of course, questions too deep and too fraught with emotion to permit settlement at the ballot box. They stir men's profounder loyalties and involve their instincts. Such questions often relate to religion or to racial matters. Possibly every human being has some mental segment unamenable to objective analysis and disinterested discussion. We find this out soon enough.

The curtain suddenly drops on reason. Dogmatism appears. Absolutism rears its head. The individual takes the position that on this matter he is so absolutely and completely right that it would be wrong even to examine his position. Furthermore, he is inclined to think that those who disagree or who think differently, hold beliefs which are "trash," as Rex Stout expresses it, or, in more extreme cases, should have their books burned, while they themselves undergo torture, starvation and slow death, as the Nazis would hold.

But, since most men are rational and objective in most particulars, they can agree sufficiently to maintain order without great involvement of their instincts and dogmas. This makes it possible for us to live together in organized societies. It enables us to decide most public matters by vote.

However, those who lose out in voting must not be alienated from democratic procedures, nor can any large class of society safely be transformed into a foe of democracy. Neither can democracies afford to adopt measures that create so deep and implacable a resentment in a considerable minority as to disrupt the common will. Then order is menaced.

Now we cannot hold dogmatically either that science knows all finally, which it never claims for itself, or that what we regard as democracy is unquestionably the best form of government ever devised by man. Possibly Mr. Stout has in mind some more coercive political structure which would better suit a great many of us. The

point is that untrammelled discussion and democratic principles are basic in our essential American tradition.

When absolutists violate these principles they menace a way of life which we fight to retain and which, by and large, pleases the vast majority of us. Thus Stout would oppose Thomas Paine's fine aphorism: "He that would make his own liberty secure, must guard even his enemy from oppression, for if he violates this duty, he establishes a precedent which will reach himself."

Stout would not understand an early Massachusetts governor, Andrews, when he said: "I care not for the truth or error of the opinions held or uttered, nor for the wisdom of the words or time of their attempted expression, when I consider this great question of fundamental significance, this great right (of free expression) which must be secure before free society can be said to stand on any foundation, but only on temporary and capricious props."

Madison made it plain, in denouncing the Alien and Sedition Acts that, if such laws had existed to forbid attacks on the government itself in the days before 1787, our Constitutional government could never have come into existence. Webster declared that repression of free thought was the seed of revolution.

Rex Stout would be inhospitable to this sentence from Lincoln's first inaugural address: "A government had better go to the very extreme in toleration than to do ought that could be construed into an interference with or to jeopardize in any degree the common rights of the citizen."

He would not like what Thomas Cooper, an American scientist who died in 1839, said: "No doctrine, of whatever nature it be, or whatever its tendency, ought to be suppressed. For it is either manifestly true, or it is manifestly false, or its truth is dubious." In the first case it should be operative; in the second it convicts itself; in the last, only free discussion can assay its value.

Such democratic philosophy must sound strangely to a dogmatic absolutist. In the Max Eastman case Judge Augustus Hand declared that it was the right of every citizen to express his opinions about anything freely, even about a war in which his country was engaged. Justice Oliver Wendell Holmes put the matter more merrily, as he naturally would, by saying that, "with effervescing opinions, as with the not yet forgotten champagne, the quickest way to let them get flat is to let them get exposed to air."

Rex Stout's view is not, as some might hold, Fascist or Nazi, for there is every evidence that he has no sympathy with these particular absolutist sects. Where he diverges from the essential American democratic tradition is in being an absolutist, in taking the position that his own beliefs are absolutely right, completely independent of criticism, and wholly unconditional. Hence, whoever disagrees is an enemy and should be silenced.

Fascism and Nazism are simply sects of the absolutist faith and they are not sects to which Mr. Stout belongs. One can be an absolutist in morals, in religion, in economics, or in diet, for that matter. The important fact is that absolutism in any form is the negation of science and the direct opposite of democracy. Moreover the scientific and the democratic methods are closely akin.

Whether one type of absolutism can transform itself into another is debatable. But to say that absolutism conflicts directly with our essential democratic tradition is simply to make a statement of fact. If in conquering certain very invidious and obnoxious forms of absolutism we ourselves somehow become converted to other forms of the same thing, we shall not have won the victory we intended to win.

Science as portrayed in editor Blumer's letters and in many other ways, is whole-heartedly on the side of democracy and is wholly opposed to dogmatism and absolutism, in whatever forms they manifest themselves. Stout, as he portrays himself in this correspondence, is a partisan of absolutism and, insofar as we believe in and want to preserve scientific freedom and democracy, we remain in the opposition.

However, we would not have Stout silenced. Only an absolutist wants thus to dispose of those with whom he disagrees. We believe he should continue to have his say, but we do fervently hope he will not win many to his side, and that the essential democratic tradition and the principles of free discussion may remain our American heritage.

## SELECTED ABSTRACTS

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**Intravenous Salicylates in Rheumatic Fever.** K. E. Martin. *U. S. Naval Med. Bull.* 44, 1000 (1945). Sodium salicylate in 1 or 1.5 per cent solution was administered intravenously in thirty cases of rheumatic fever, twenty-six of which had histories of previous similar attacks ranging from a few months to many years.

This therapy followed the recommendation published by Coburn in 1943. The number of daily doses of the solution averaged thirteen per patient. All cases were routinely followed by temperature readings, repeated sedimentation rates, chest X-rays, heart measurements and electrocardiographs.

The temperature returned to normal in an average time of four and one-half days, and the joint symptoms were absent after from two to eight days. Minor complaints of tinnitus constituted the only drug reaction noted. When the sedimentation rate dropped, 33 per cent salicylates were administered orally.

The author believes that this therapy represents a decided advance in the treatment of acute rheumatic fever.

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**Topical Application of Penicillin in the Treatment of Vincent's Infection.** K. R. Cofield, E. W. Ferguson and A. E. Toye. *J. A. D. A.* 32, 529 (1945). A report is presented on the treatment of twenty-five cases of Vincent's infection by the topical application of penicillin. In a few instances this therapy was augmented by the oral administration of nicotinic or ascorbic acids, or both. A graph is also presented on sixty cases treated with penicillin and various other drugs, indicating the number of days of treatment required to assure disappearance of the organisms from the site of infection.

The ideal concentration of penicillin for this purpose appeared to be 500 Oxford units per cc. of normal saline solution. In order to maintain contact between the drug and the infected tissue, sterile cotton rolls wrapped in gauze were used to isolate the latter. The



use of a saliva ejector prevented undue dilution of the penicillin solution, about 5 cc. of which were required for each treatment. The solution was applied as a spray to the entire mouth and throat and to the cotton rolls. In addition, pledgets of cotton saturated with the solution were packed in the interproximal spaces and all periodontal pockets.

Satisfactory results were obtained when the packs were allowed to remain in the mouth for fifteen minutes. It was found that cases of oral infection could be successfully treated after one or two packings by spraying with penicillin solution and holding it in the mouth for three or four minutes. The use of normal saline solution as a mouth wash three times daily between treatments was advised.

In the twenty-five cases reported, mucous patches disappeared within from twenty-four to forty-eight hours, and inflammation, soreness and bleeding subsided within seventy-two hours. The smears of Vincent's organisms became negative in from three to five days in the majority of cases.

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**The Use of Penicillin in Clinical Dentistry.** L. Weiner. *J. A. D. A.* 32, 538 (1945). Penicillin was administered by either local or intramuscular injection, or both, in the treatment of a number of dental infections. In twenty-four cases of pericoronitis, the dosage ranged from 8,000 to 500,000 units; in six cases of cellulitis, from 12,000 to 440,000 units; in eleven cases of alveoalgia (dry socket), from 20,000 to 527,000 units; and in eight cases of post-operative infections, from 10,000 to 55,500 units.

Penicillin therapy was effective in all of these cases, and recovery was rapid.

Root canal therapy with penicillin was successful in five out of six additional patients. In these cases, a sterile technic was employed. A penicillin solution was used to syringe the pulp canal, and was sealed in it between visits. In addition, it was infiltrated about the apex of the tooth. From 5,200 to 40,000 units of penicillin were used in each case so treated.

Pending further study of the dosage, the authors recommend as initial treatment one or two local injections of 10,000 units, after which a combination of local and intramuscular routes may be used. For the latter, 20,000 units per dose is recommended; the adminis-



tration of 0.4 cc. of 2 per cent procaine with epinephrine is advisable to prevent pain.

Toxic reactions which were noted in two patients were urticaria, fever and chills.

A number of case studies included in this series are presented in considerable detail.

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**Chemotherapy in Tuberculosis: Present Status.** K. H. Pfuete. *Clinical Med.* 52, 186 (1945). Clinical trial of Promin (sodium *p*, *p'*-diaminodiphenylsulfone N, N'-didextrose sulfonate) on a group of tuberculous patients resulted in a more rapid improvement in 25 per cent of the cases as shown by roentgen examination than was to be expected from a routine rest regimen alone.

These observations have been confirmed by other authors in some instances, while others have concluded that the toxic effects of the drug outweighed its benefits.

Seven additional cases of bone tuberculosis with draining sinuses were treated by the oral administration of Promin and its local application in a jelly. After two months of therapy, drainage ceased in four cases and improvement was noted in the others.

The toxicity of Promin is a drawback to its extensive use. It tended to cause a drop in hemoglobin in the majority of patients, and occasionally leukopenia as well. Anorexia and restlessness were frequently noted.

Diasone (disodium formaldehyde sulfoxylate diaminodiphenylsulfone) was administered to a series of thirty-six patients having pulmonary tuberculosis. The average daily dose was 1.7 gm.; therapy was continued for from 120 to 399 days.

The results, as determined by serial roentgen examination, were somewhat disappointing. Only two patients showed a marked improvement and seventeen a moderate or slight improvement; there was no change in nine, but in the remaining eight there was a definite spread of the disease.

While Diasone was found to be less toxic than Promin in comparable doses, its use was nevertheless accompanied by a reduction of hemoglobin in one-half of the cases and cyanosis in all except three. Other reactions observed included nervousness, irritability, anorexia, fever, angina, nausea, and an exfoliative eruption.

Preliminary observations on Promizole (4, 2'-diaminophenyl-5'-thiazolesulfone) indicate that it is much less toxic than Promin or Diasone; a daily dosage of 10 to 12 gm. for several months was found to be tolerated in some instances. In renal tuberculosis it appeared to give some symptomatic relief, but in no instance was there a disappearance of tubercle bacilli from the urine. No benefit from its use was noted in five cases of tuberculous meningitis and two cases of miliary tuberculosis.

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**A Simple, Rapid Technic of Preparing Water-in-Oil Emulsions of Penicillin, Drugs and Biologics.** J. Freund and K. J. Thomson. *Science* 101, 468 (1945). Unpublished work by the authors, in collaboration with other investigators, has demonstrated that the effect of penicillin may be prolonged by the intramuscular injection of a W/O emulsion of the drug, as compared with a similar amount of aqueous solution administered by the same route. It was also observed that a single simultaneous injection of 100,000 Oxford units of penicillin in W/O emulsion and 50,000 units in aqueous solution produced cures in all of forty cases of acute gonococcal infection so treated.

The authors have devised a method for preparing W/O emulsions of penicillin which is adapted for use at the bedside or in the clinic. By means of a sterile syringe 1.4 ml. of sterile 0.85 per cent salt solution are added to a vial containing 100,000 units of dry penicillin. To the resulting solution 3.1 ml. of an autoclaved mixture containing eleven parts of "Falba" (a lanolin-like substance manufactured by Pfaultz and Bauer, Inc., New York) and twenty parts of peanut oil are added by means of a sterile syringe fitted with a 17-gauge needle. With the needle remaining inserted through the rubber cap, the mixture can be readily emulsified by repeated withdrawals and ejections.

When the product has assumed a uniformly creamy, slightly viscid consistency, it is ready for injection.

It is stated that water-soluble drugs and biologic products, and also aqueous suspensions of bacteria and viruses, can be emulsified by this technic.

**Seroprophylaxis in Experimental Rabies.** K. Habel. *Public Health Rep.* 60, 545 (1945). Rabies immune rabbit serum was produced and concentrated by a method which is described. Studies made on guinea pigs, mice and monkeys indicated that serum prophylaxis as the sole postinfection treatment of rabies was consistently more dependable than vaccine alone.

Serum prophylaxis was apparent up to three days after infection; it was more effective when administered intramuscularly at the site of virus inoculation than by the subcutaneous route elsewhere on the body. For protection against street virus infection a combination of serum and vaccine prophylaxis was found to give the best results.

If both serum and vaccine are to be given, for the most effective results an interval of six days should elapse between the dose of serum and the beginning of the course of vaccine. The experimental observations suggest that rabies serum prophylaxis in man may have several advantages. It is probable that many of the "vaccine failures" in which there has been a short incubation period are due to a lack of sufficient time for the vaccine to produce immunity in the nervous tissue. Since the authors observed that the serum possessed the ability to prolong the incubation period in animals, it would appear that the administration of serum at the site of the bite of the rabid animal would make possible specific treatment while the virus is still localized.

It is believed that serum alone would be sufficient for patients who have had the type of exposure now requiring fourteen doses of vaccine. In those cases where the twenty-one-dose course of vaccine is necessary, it is suggested that the serum should be followed by a course of vaccine six days later.

It is possible to establish a diagnosis of rabies within six days by mouse inoculation of the brain of the suspected animal. Thus, if the diagnosis is positive, there is sufficient time to institute the course of vaccine at the end of a six-day period following the administration of a dose of serum to the patient. On the other hand, if the diagnosis is negative, the patient will have received only a single dose of serum and will be spared the needless discomfort and possible danger of a course of vaccine.

## BOOK REVIEW

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**The Analysis of Foods.** By Andrew L. Winton, Sometime State and Federal Chemist, and Kate Barber Winton, Sometime State and Federal Microscopist, Wilton, Connecticut. John Wiley & Sons, Inc., New York, 1945. xii + 999 pages, 208 illustrations. 6 1/4 by 8 13/16. Price, \$12.

*The Analysis of Foods* is the latest in the series of distinguished and distinctive contributions by the Wintons to recorded knowledge concerning foods. A book of one less than a thousand pages, it lists over a thousand methods of analysis applicable to foods; most of the methods are described in sufficient detail to serve as working procedures.

The book is divided into two main parts, the first dealing with general methods, the second with special methods employed in the analysis of specific foods. Part I comprises 416 pages, and is devoted mainly to a discussion of methods for determining water, protein, fat, nitrogen-free extract, fiber, ash, alcohols, vitamins, natural and artificial colors, and chemical preservatives. Part II, captioned special methods, and numbering 530 pages, describes methods of analysis for cereal foods, fatty foods, vegetable foods, fruit foods, saccharine foods, alcoholic beverages, dairy products, animal foods, alkaloidal products, food flavors, leaven, and salt. The methods described include not only those which have been widely adopted, but also lesser-known methods which have been adequately tested in a reputable laboratory and reported in the literature. The reader need peruse only a very few pages to convince himself of the thoroughness of the search of the literature which has been made in preparing the manuscript. Though in many cases the discussion is brief, each method is adequately explained and, for many methods, chemical equations representing the characteristic reactions are provided. Well-planned captioning of paragraphs serves to summarize each method and to indicate at a glance the principal steps. Abundant references to the literature are given for each method.

Other features of the book which will interest many are brief chapters on apparatus, reagents, general microscopic methods, and general physical methods. Teachers will find useful the suggested short course in food analysis provided by the authors; complete laboratory directions are given for each assignment.

Every chemist engaging in food analysis will want to own a copy of this excellent book, and those who have occasion to be concerned with some aspect of the subject only now and then will find this most recent "Winton and Winton" to be a reference "must."

ARTHUR OSOL.



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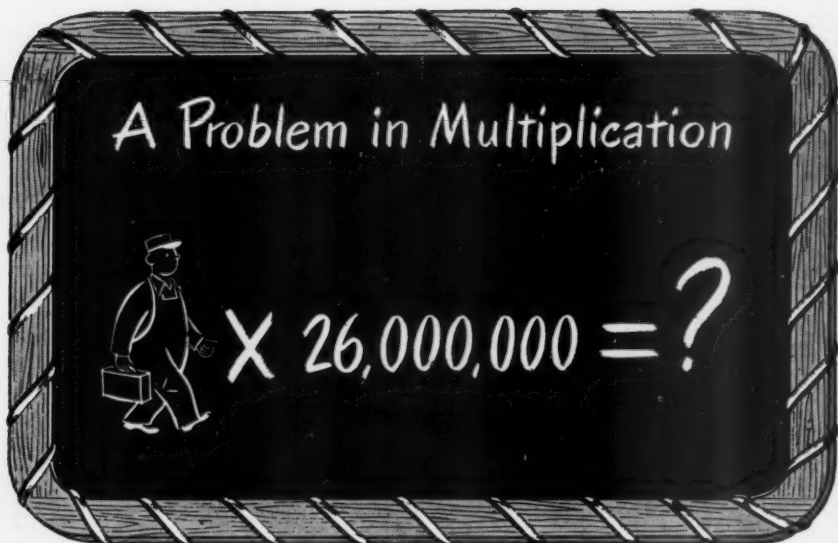
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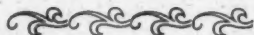
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